

and a judgement of the Circuit Court of Appeals and a mandate of said court was reached by which the Fays received all the land west of the so-called "division line" near the corner of North Street and Gosnold Drive. The agreement established a 40-foot strip immediately to the west of the line as a permanent place of landing for all those people who had been conveyed such a right in the preceding real estate transactions. The United States was left with the remainder of the land deeded by J. S. Fay, free of all restrictions set out in the original deed. The agreement and judgement mentioned above were honored by the land court (Land Court Case No. 5985) and the certificate No. 457 in favor of the Fays was issued.

Considerable confusion in the title of the U.S. Fisheries property at Woods Hole was caused by the lack of clarity in the original title and by the informal agreements made by Baird with the selectmen of the Town of Falmouth. These parties agreed to exchange a portion of the western end of Water Street, owned by the town, for an equivalent area of Fisheries land, 40 feet wide, extending from Center Street to the water. This arrangement enabled the Town of Falmouth to construct a wharf which is used now as a public landing. The private exchange made between Commissioner Baird and the Town of Falmouth remained without proper legal action until 1956 when the real estate holdings were reviewed by the Branch of Lands of the Regional Office of the Fish and Wildlife Service (Ennis Abbiati's report on file in the Bureau of Commercial Fisheries Regional Office in Gloucester) and the necessary legal action was made to convey the title to a short portion of Water Street owned by the Town of Falmouth to the U.S. Government.

The western end of the Commission's property along North Street, consisting of approximately 1.03 acres in area, was for many years rented by the Government to the Woods Hole Yacht Club. In 1958 the parcel was declared surplus property and in accordance with Private Law 85-367 was transferred for \$6,000 to the Woods Hole Yacht Club with the provision that the conveyed property is to be used only by the Club and for the purposes "to which it is now put, namely, the usual activities of a non-commercial yacht club." The property cannot be transferred or assigned in any manner to other parties without the prior consent of the U.S. Government and cannot be used for any activities that may be detrimental, as determined by the Government, to the operation of the Bureau of Commercial Fisheries Biological Laboratory. The conveyance was made for only as long as the Woods Hole Yacht Club remains in existence, and in case of its dissolution the property with all improvements shall revert to the United States. The deed executed by the Administrator of General Services has been recorded on February 1, 1961, in the land records of Barnstable County, Mass. in Book 1104, page 129.

Through the efforts of various business firms in Massachusetts, insurance companies, and masters of many coastal vessels, a bill was introduced in the House requesting an appropriation of \$52,000 for the construction of a refuge in the Great Harbor of Woods Hole to permit vessels of 20-foot draft to come in and remain in perfect safety in severe storms and to furnish the basins for keeping live fish. The magnitude of the appropriation induced President Chester A. Arthur to defer approval for one year. The refuge was built in 1884 (fig. 16) and proved to be a valuable asset to the station, not only as a safe shelter for small boats, but also as a convenient place to keep live-cars containing fish and invertebrates and conduct observations and experiments.

Before commencing the construction of the necessary buildings, Baird engaged the services of E. W. Bowditch, a well-known landscape architect and engineer, to make a careful survey of the land and prepare a map (scale of 20 feet to one inch) including the contour lines at one-foot intervals over the entire surface. Plans for the buildings were made by Robert H. Slack, Boston architect, and the contract for the erection of the first building was given to W. R. Penniman of South Braintree (Boston).

Drawings made under Baird's guidance showed his full understanding of the station's needs and his great ability to visualize minute details in planning the laboratory and in designing water tables, chemical benches, and other laboratory furniture. He was assisted in this work by Verrill.

With the appropriation of \$25,000 by Congress for construction purposes, the first building to be erected was the "quarters" for the personnel. Upon completion the structure became an outstanding landmark of Woods Hole and was always called the "Residence." Concurrently with the work on the foundation of the residence building, the excavation and dredging for the piers was carried out. In addition to the residence building, the station plans included the laboratory and hatchery building, the pump house with a sea-water reservoir, a coalshed, and a storehouse.

Construction of the laboratory building, 120 x 40 feet, began in 1884 and was partly finished that same year. Serious difficulties were encountered in laying the foundation, which had to be erected on unstable grounds regularly covered by water at high tide. It was necessary to drive wooden pilings upon which the structure rested. In February 1885, the construction of the laboratory and hatchery was completed by Brightman, a New Bedford contractor, and was accepted by the Commission. For nearly three-quarters of a century the building withstood the violence of Cape Cod storms and



Figure 16.--Small boat refuge shortly after its construction in 1885. Seal pool in foreground; draw bridge at right; and U. S. S. Albatross at the dock. The wharf across the refuge was used for docking launches and suspending live-cars.

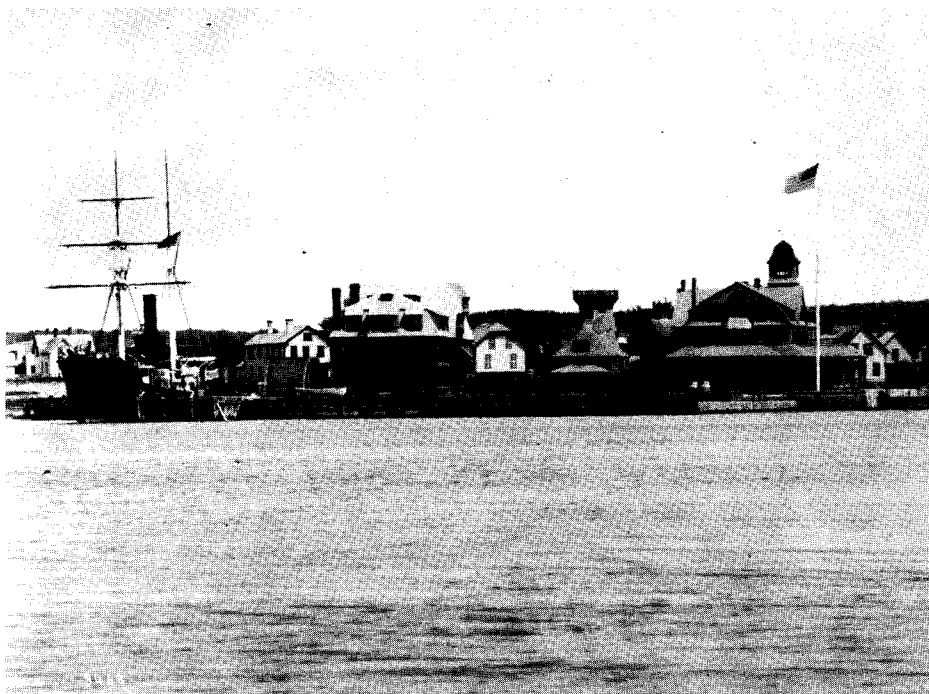


Figure 17.--Residence (right) and laboratory of the Woods Hole Station shortly after their construction. Pumphouse, machine shop and sea-water tank (towerlike structure) are in the middle. About 1890.

hurricanes. Although the ravages of old age were noticeable, the structure remained strong. Old pilings pulled out of the ground when the building was demolished in 1958 showed no signs of deterioration.

The total amount of money appropriated from time to time by Congress for the Woods Hole Station buildings and their equipment amounted to \$70,000. The completion of the laboratory with auxiliary structures and wharf greatly changed the face of Woods Hole. Photographs taken at this time (fig. 17) show the imposing three-story brick and frame structure of the residence, crowned with cupola and set on the shores of Great Harbor at the end of Water Street. Several letters exchanged between Baird and town officials refer to the grounds as "Refuge Point." The name was not officially recognized, it did not appear on any charts or documents and was later abandoned.

In the summer of 1885, Baird with his staff of assistants and several clerks moved into the new building. A. E. Verrill was in charge of the laboratory and with other biologists continued investigations on the habits and development of fishes and marine invertebrates. The following biologists not employed by the Fish Commission used the facilities of the newly established American marine laboratory: Richard Rathbun, Sidney I. Smith, Sanderson Smith, E. Linton, B. F. Koons, Harrison Allen, William Libbey, Jr., and Walter Heape of Cambridge, England.

An interesting experiment of introducing marine species into a new environment was carried out. For the first time, a lot of young shad were transported in a railroad car to the Pacific Coast and planted in the waters of Washington Territory and Oregon. In return, G. H. H. Moore who was entrusted with the task, collected and brought back to Woods Hole a large number of clams, Tapes staminea. A great many clams perished enroute, but several hundred which survived and appeared to be in good condition were planted in various locations in the vicinity of the station. Shad transplanting was continued in later years, and the Atlantic species is now well established on the Pacific Coast, but Tapes staminea apparently did not survive and was never found in Woods Hole waters.

A series of oyster breeding experiments were made that summer by John A. Ryder, using the ponds constructed on private grounds near Eel Pond, Woods Hole, owned by J. H. and Camilla J. Kidder.

Jerome H. Kidder, medical officer of the U. S. S. Albatross, made a detailed chemical study of the fresh-water supply to the new laboratory and found it to be "potable and of good quality." The source of fresh water available at that time was a small spring or well located at Bar Neck. The water level in the well ordinarily stood at a height of about four feet above mean low water. To one analysis, Kidder attached the following statement: "The sediment (of water from the well) contains unicellular algae, rotifers, paramecium, amoeba, and woody fiber. No evidence of impurity injurious to health" (Kidder, 1886). The reference to Paramecium and Amoeba make one suspicious about the quality of drinking water available at that time.

Another interesting and comprehensive study, also by Kidder, deals with the accuracy of the thermometers used by the Fish Commission in marine exploration. Of particular significance are the tests of Negretti-Zambra deep-sea reversing thermometers and maximum and minimum thermometers made by Miller-Casella. This type of thermometer is provided with short steel rods which are pushed by a column of mercury and can be reset by using a small magnet. The reversing and

maximum/minimum thermometers were not free from certain defects and peculiarities which often lead to erroneous readings. These difficulties are fully discussed in Kidder's paper (Kidder, 1887). Baird himself contributed to the technique of temperature observations by designing, in 1873, a protected thermometer, enclosed in cylindrical copper cases with a hinged door in front. This type was devised for reading water temperatures at light-houses and at shore stations. The instrument is still being used for observations in shallow waters when great accuracy is not needed.

The thoroughness shown by Baird in every detail pertaining to the operation of the station speaks for his versatility and ingenuity. The equipment of the laboratory and hatchery was designed by Baird with the assistance of Verrill. Both men had considerable experience in that type of work. Verrill was particularly skillful in designing aquaria tanks and tables. Baird was well known by the designs of storage cabinets for the specimens in the National Museum which were made to save valuable museum space and fit exactly between the supporting wall columns. The actual construction and materials used by the contractor for laboratory benches, chemical and office tables, and of other equipment were meticulously scrutinized and personally approved by Baird.

The new laboratory building was three stories high. The entrance hall on the first floor separated the hatchery, on the south side of the building, from the public aquarium on the north. Large sea-water tanks of the aquarium were mounted along the outside walls, while the center was equipped with cabinets for preserved specimens of fish, invertebrates, and birds. The hatchery equipment consisted of a series of tanks containing floating frames, each frame having the bottom covered with cloth for holding fish eggs (fig. 18), and batteries of McDonald hatching jars. The excellent supply of sea water and good equipment insured successful hatching operations. A wide stairway led to the second floor. The northern half of the second floor was occupied by a large laboratory equipped with tables for biological research (fig. 19). The tables were the last word in laboratory furniture. They were covered with thick birch planks painted black, with acid and alcohol-resistant paint. Each table contained a stack of deep drawers on one side. The southern side of the second floor contained three offices, a fairly large chemical room equipped with two chemical tables, accommodating eight persons, and a fume hood. There was a small storage room for stationery and office supplies. The third floor was occupied by the library, two large stockrooms (one for chemicals and one for glassware and scientific instruments) and several small rooms in which the fish culturists and janitor lived. In later years these rooms were converted into laboratories.

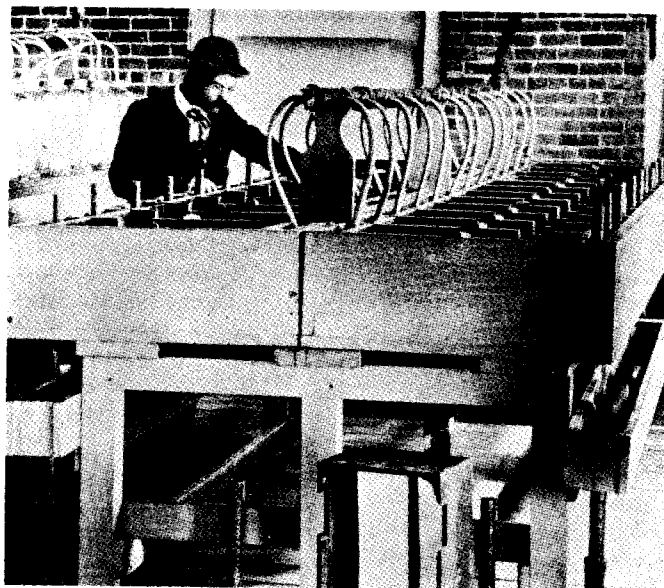


Figure 18.--Interior of the hatchery. Sea water is supplied to each of the tanks individually and fills it from the bottom and is drained from the top through an overflow into a trough seen at right. A wooden frame (standing in front) with cloth bottom for holding eggs floats freely in each tank.



Figure 19.--Interior of the laboratory shortly after its construction in 1885. Laboratory tables and other furniture were designed by Baird and Verrill.

The hatchery was a great asset to biological research. Some of the hatching tanks, not needed for current hatching operations, were at the disposal of the biologists for keeping animals and for studying the development of marine eggs. Outdoor tanks and live-cars anchored inside the protected area of the boat refuge (fig. 16) were of great convenience. An examination of old plans and photographs of the laboratory will show how much of Baird's thinking, experience, and imagination went into the implementation of his dream. At the time of its opening in 1885 the Fisheries Station at Woods Hole was an excellently equipped institution for marine research, equal to or better than any laboratory of this type in Europe.

Good docking facilities at the Fisheries Station made possible the full use of the Fish Commission ships. Two large vessels, the Fish Hawk and the Albatross, frequently used Woods Hole as a base of their operation. The ships were not permanently assigned to the station but from time to time were ordered by the Commissioner of Fisheries to proceed to the areas where in his opinion they were needed for conducting sea explorations. It was Baird's plan, however, to use Woods Hole as the home base for the ships, and both the Albatross and Fish Hawk were frequently seen at the Fisheries dock at Woods Hole.

#### U. S. S. Fish Hawk

The Fish Hawk (fig. 20) was a coal-burning steamer of 156-1/2 feet overall length. She was registered at 484 tons displacement and had a rig of "a fore-and-aft schooner with pole topmasts." She was built according to specifications and plans made by C. W. Copland, naval architect of the Light-House Board. It was a special vessel to serve as a floating hatchery for the production of shad, herring, striped bass, etc., and was capable of being moored almost anyplace where breeding fish could be found in sufficient quantity (Tanner, 1884).

A considerable portion of the deck space and hull was occupied by hatching equipment and laboratory. The laboratory was 10 feet, 7 inches long, 9 feet wide and 7 feet 3 inches high. It was provided with a laboratory table, specimen case, box for microscope, and the necessary shelves and drawers. Sea water was supplied by a steam pump capable of delivering 10,000 gallons per hour. Hatching equipment consisted of 36-inch cone-shaped containers each capable of holding 7,200,000 shad eggs. These hatching cylinders were suspended from beams outside of the vessel.



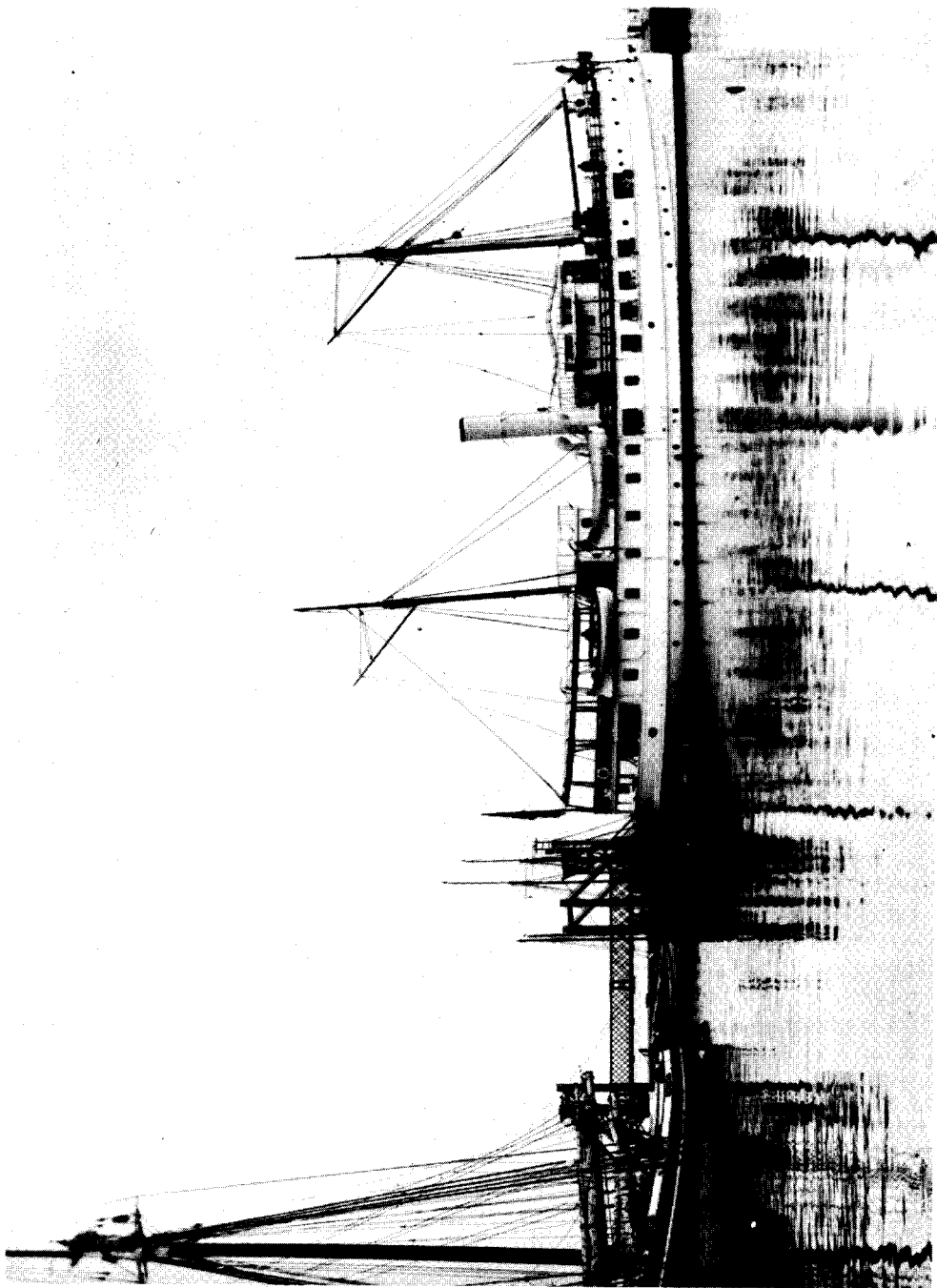


Figure 20.--U. S. S. Fish Hawk at Woods Hole.

The ship was equipped with the most up-to-date gear for trawling and dredging. There was a drum or reel holding 1,000 fathoms of steel-wire dredge rope 1/3-inch in diameter (1-1/8 inch in circumference) with breaking strain of 8,750 pounds; the wire rope weighed 1.14 pounds per fathom. The dredging boom was 36 feet long and 10 inches in diameter. It was used for operating beam trawls of three different sizes (9 feet, 11 feet, and 17 feet long beams), otter trawls, and various dredges (fig. 21).

Other types of collecting gear such as tangle bars, rake dredges, and various sieves (so-called table sieve and cradle sieve) were designed by Verrill. The sounding machine consisted of a cast brass reel 11.43 inches in diameter and 600 fathoms of piano wire of 0.0028 inch diameter, having a tensile strength of 200 pounds.

Built primarily as a "hatchery ship" the Fish Hawk was not suitable for offshore work but was intensively used in dredging and trawling in Vineyard Sound, around Cape Cod, in the Gulf of Maine, Long Island Sound, and other coastal waters. The ship made her last two cruises in October-December, 1925, and was decommissioned in January 1926.

#### U. S. S. Albatross

The Albatross (fig. 22) was an iron-hull, twin-screw vessel of 234 feet overall length and 1,034 tons displacement (registered net tonnage 384 tons). She was built by the Pasey and Jones Company of Wilmington, Del., according to the plans drawn by Charles W. Copland of New York; aggregate cost was \$145,000. She was launched in March 1882, and made her first cruise in April 1883.

According to Lt. Com. Tanner, her first commanding officer (Tanner, 1885), she was rigged "as a brigantine, carrying sail to a foretop-gallant sail." She had comfortable cabins, had water distilling equipment for drinking water, electric lights, and elaborate equipment for oceanographic research. There were two laboratories. The upper one, 14 feet long and occupying the whole width of the house, had a square work table for four persons centrally located. Each working place was provided with a tier of drawers under the table. Attached to the walls were two hinged side tables, a sink, water and alcohol tanks, wall cabinets for instruments and glassware, and books. A medical dispensary occupied a corner of the room. The lower laboratory, immediately below the upper one extended across the ship 20 feet fore and aft. It was supplied with long working tables and a lead-lined sink with running water. Part of the space was used as a